THE ANALYST.

OCTOBER, 1902.

OBITUARY NOTICE.

THE LATE SIR FREDERICK ABEL.

We regret to have to record the death of one of our honorary members, Sir Frederick Abel, which took place on September 6, at his residence in Whitehall Court. He was born in 1827, and commenced his chemical career in 1844 at the Royal Polytechnic Institution; this he left in the course of a few months, and became one of the first twenty-six students who entered the Royal College of Chemistry, which commenced its active career in 1845, under the direction of A. W. von Hofmann. Here he spent six years, for the greater part of the time acting as one of Hofmann's assistants, and left to succeed Faraday as Professor of Chemistry at the Royal Military Academy. In 1854 he was appointed Chemist to the War Office, which position he held for thirty-four years, during which time he devoted much attention to the study of explosives. Sir Frederick devised the first apparatus, known as the "open test" instrument, for determining the flash-point of petroleum, and this apparatus was legalized in the Petroleum Act of 1868. The indications of the instrument having been found unreliable, Abel brought out an improved apparatus, the "closed test" instrument, which was adopted as the basis of the British standard of 73° F. in 1879. He rendered valuable service as a member of the Council of the Inventions Exhibition of 1885. On the formation of the Imperial Institute two years afterwards, Sir Frederick was appointed secretary and general director, which duties he continued to perform until quite recently. He was elected a Fellow of the Royal Society in 1860, and was awarded a medal by that body in 1887. He served at various times as President of the British Association, the Chemical Society, the Institute of Chemistry, the Society of Chemical Industry, etc. The University of Cambridge, in which he filled the office of Rede Lecturer, conferred the honorary degree of D.Sc. on him in 1888, and Oxford that of D.C.L. in 1883. Finally, he was made C.B. in 1877, a Knight in 1883, K.C.B. in 1891, a Baronet in 1893, and G.C.V.O. in 1901.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

NOTE ON A SIMPLE APPARATUS FOR APPROXIMATELY ESTIMATING THE COLOURS OF WATERS.

By W. T. Burgess, F.I.C.

(*Read at the Meeting, March* 5, 1902.)

Several instruments capable of being used as colour meters for waters have been described, but have not come into general use, probably owing to the initial cost of the apparatus. I have found the inexpensive arrangement described below very convenient, and probably it may be of service to others, who, like myself, have occasion to make systematic examinations of water-supplies.

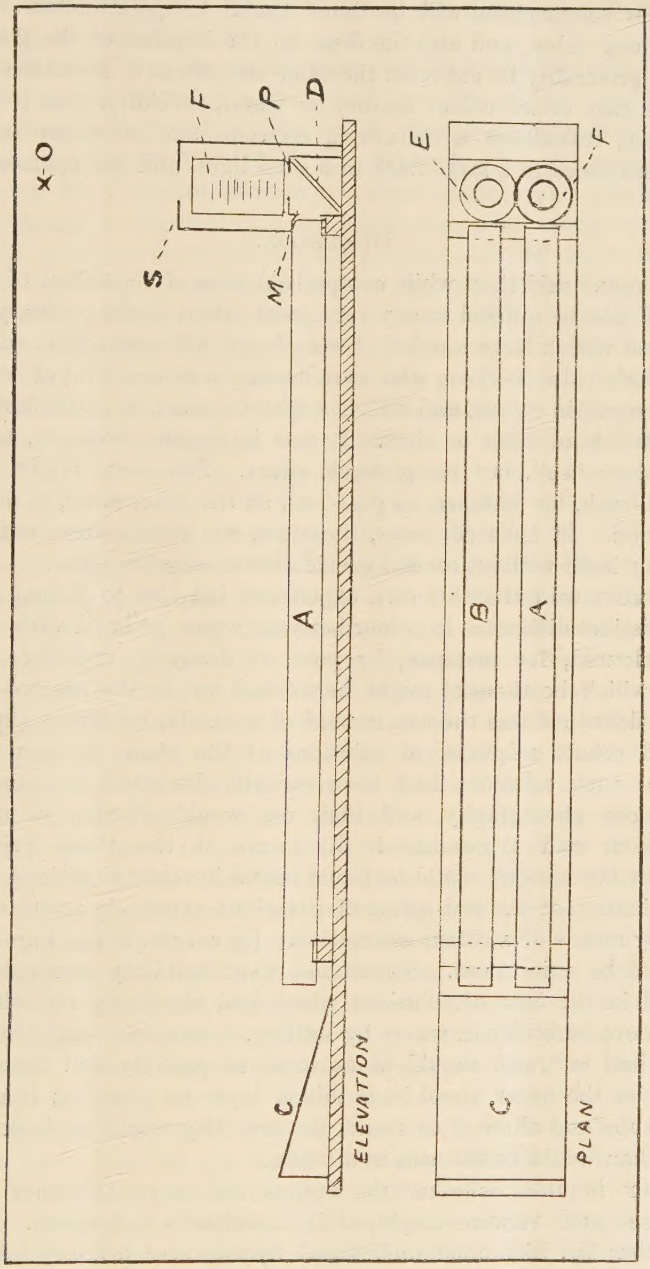
The water to be observed is contained in a horizontal 2-foot tube A (see figure) by the side of a similar tube B, containing distilled water; light, reflected from an inclined white card C, passes through both tubes, and a mirror D, fixed at an angle of 45°, reflects it upwards, so that the tints of the waters may be seen and compared by the observer's eye at O, about 10 inches above D. The ends of the 2-foot tubes rest against a mask M (having two circular holes 19 millimetres diameter), which screens off all light from the mirror except that passing through the tubes. Above the mirror D is a little platform P, provided with two circular openings, 19 millimetres diameter, and supporting two short cylindrical glasses E and F, 70 millimetres high and 40 millimetres diameter. A few c.c.'s of distilled water are placed in the cylinder F (through which the water under examination is observed), and a standard brown solution is run into the other cylinder E (above the distilled water 2-foot tube) until the colour of the water in A is matched. The depth of brown solution necessary is recorded in millimetres, read off either from a scale on the side of the cylinder E, or by immersing a small transparent glass or celluloid millimetre rule in the brown solution itself.

To facilitate the comparison, the mirror D is divided transversely, and the two halves slightly tilted and adjusted so that the images from both tubes may be observed simultaneously, without moving the eye, at O; and in making the final adjustment with the standard brown solution the cylinders are covered with a cardboard box screen S, provided with two viewing holes in the top.

The standard brown solution which I have found most convenient and generally applicable is the same as that now used in the colour meter originally described by Crookes, Odling, and Tidy (*Chem. News*, 1881), and consists of a solution containing 1 gramme of pure crystallized cobalt sulphate and 0·05 gramme of potassium bichromate in 1 litre. Occasionally the tints of waters are better matched by a somewhat browner solution containing 1·5 grammes of the cobalt sulphate and 0·05 gramme of potassium bichromate to the litre. The solutions keep well, but should be checked occasionally.

The 2-foot tubes are of stout glass, about 26 millimetres external diameter; on one end a disc of nearly colourless glass is cemented; round the other end a strip of

thin celluloid (10 millimetres wide, and in length 10 millimetres less than the circumference of the tube) is tightly bound by wire, so that the strip projects about



1 millimetre beyond the tube. To fill, the tube is held vertically, and completely filled with the water; a disc of thin glass placed on the open end is held in position

by the celluloid and surface tension, and after wiping the outside of the tube it may be placed on its side, or even inverted, without any risk of leaking. Possibly small tubes of similar construction will be found useful for polarimeters. All the glass discs for the long tubes, and also the discs for the bottoms of the glass cylinders E and F, should preferably be cut from the same thin sheet of colourless glass.

As in the case of all colour meters for water, turbidity, even if present in the slightest degree, introduces a disturbing element, and all water samples should, therefore, be examined in a large flask in a good light, and any opalescence noted.

Discussion.

The President said that, while comparison tests of the colour of water samples probably could not be utilized to any very great extent by the ordinary water analyst who had to deal with a large number of samples of different origin, such tests would be of considerable value to those who were dealing with one kind of water which did not alter very much in colour, and which might be taken as a standard or compared with a standard from time to time. It was important, however, to consider not merely the colour itself, but its probable cause. The cause might be an entirely harmless one—such, for instance, as peat—or, on the other hand, it might be due to sewage pollution. In isolated cases, therefore, too much stress must not be laid upon the colour itself without careful consideration as to its cause.

Mr. Richmond said that his own experience led him to believe that there was often a very distinct difference in colour between water polluted with animal matter and water coloured, for instance, by peat or decaying vegetable matter. One improvement which he thought might be worked out in the case of the apparatus that had been described was the use, instead of a standard solution, say, of potassium chromate and cobalt sulphate, of solutions of the three primary colours. The preparation of such solutions had been recently described in connection with a process of colour photography, and their use would afford a valuable means of estimating colour and expressing it in terms of the three primary colours. Accurate colour estimations would be found useful in other directions. For instance, in the determination of the end-points of titrations extremely accurate results could be obtained by means of a colour estimation. Of course, it was imperative that the solution should be quite clear. Sometimes, when turbidity occurred, colour effects were obtained in the case of solutions which had absolutely no colour. In order rapidly to remove turbidity in water by settling, it was necessary that the distance the particles had to travel should be as small as possible, and therefore it was an advantage to let the water stand in as thin a layer as possible; if the water were put into the tube and allowed to stand, the turbidity would settle down in a much shorter time than would be the case in a bottle.

Mr. Allen inquired whether the author had any experience of the use of coloured glasses such as were employed in Lovibond's tintometer. He would also like to hear what Mr. Richmond understood by the three primary colours—whether red, yellow, and blue, or red, green, and violet—and how he would propose that they should be obtained.

Mr. Richmond said that the primary colours he referred to were red, green, and violet, or blue-violet—*i.e.*, the three colours which, when they were made into screens and the light was passed through the screens separately and then combined, yielded a white or neutral gray light.

Mr. Allen inquired how the purity of the colours would be insured.

Mr. Richmond said that, as a matter of fact, the colours could be obtained absolutely pure if necessary, and colours which, though not absolutely pure, served satisfactorily as primary colours, could be obtained without much trouble. In a recent paper on the Lumière process of colour photography (abstracted in the *Journal of the Society of Chemical Industry*, 1902, page 275) were given the compositions of solutions by which the three primary colours could be prepared.

Dr. Rideal said that it was perfectly true that the estimation of the colour of water had most value when a comparison was being made between different samples from the same source; but, after all, that was frequently the kind of problem that had to be dealt with. Whether or not a water was good depended upon whether it remained constantly in the same condition, and whether it was similar to other waters in the same neighbourhood, so that variations of colour might be expected to throw some light upon the problem under investigation. In one case recently which he had had to deal with the colour of the water was certainly an important factor. In that case it had to be decided whether a peaty water, itself initially coloured, was contaminated with colliery water or with sewage or farmyard drainage. In addition to the colour imparted by the peat, the black colour from the coal, that due to urine from the men in the colliery, and from the farmyard contamination, all influenced the final colour of the waters. All of these colours were distinct, and although they all appeared to be more or less brown-yellow, the amount of each could be fairly accurately gauged by a Lovibond tintometer with varying tube-lengths. The brown-yellow colour of waters contaminated by any of these four different colours might be of approximately the same intensity in a tube 2 feet long, but if instead of using a tube of constant length one estimated the colours in tubes of different lengths, such as were used in polarimetric work, the fraction of absorption of the different colours would be different for each of the different colouring matters, and a very good differentiation could be arrived at by such means, even in cases where the colours were apparently the same when observed in a tube of fixed length.

Dr. Munro said that he had had occasion once to examine a spa water with a view to ascertaining whether the water was contaminated by the water of either of two small rivers which ran in front of the pump room only twenty or thirty yards from the well itself. One of these rivers was a limestone river, the bed of which was nearly pure carbonaceous limestone. The other was a boggy river deeply tinted with peat. It was perfectly easy, from a comparison of the colour alone of the three waters, to prove that the spa water was not contaminated from either of the other sources. It would not have been easy with merely a standard solution to go upon, because, although such a solution as had been mentioned in the paper would very fairly represent the colour of peaty water, it would not represent that of the limestone water, and still less that of the spa water. He had used in this case Lovibond's tintometer, by which with coloured glasses practically any tint or colour in water could be matched.

Mr. BURGESS, in reply, said that it was, of course, impossible to form a proper opinion about a water merely from its colour, but he kept a record of the colour of all samples of water that he examined for reference in dealing with the same water subsequently. He had not had much experience with Lovibond's tintometer, but when he had tried it very carefully he had found it to suffer from one serious difficulty—namely, that in the case of waters containing very little colour the coloured discs themselves produced a dulness, and the light was considerably reduced in intensity. That was a difficulty which he, at any rate, had not been able to get over, and he had accordingly arranged the apparatus he had described, in which there was nothing to interfere with the brilliancy of the illumination. The standard solutions could be easily varied for different tints, and it would be easy to use tubes of different lengths, as suggested by Dr. Rideal.

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOODS AND DRUGS ANALYSIS.

Refractive Indices of Salad Oils—Correction for Temperature. L. M. Tolman and L. S. Munson. (*Journ. Amer. Chem. Soc.*, xxiv., 754.)—The authors find that, using a Zeiss butyro-refractometer, the variation in the refractive index for 1° C. is practically constant at 0·000365 for ordinary oils, although the variation of the scale-reading of the instrument is not constant, since the scale is an empirical one. The most accurate way to correct scale-readings for temperature is to calculate the refractive index from the scale-reading found, correct it by means of the above factor, and then calculate back to the scale-reading. For variations of a few degrees only the formula—

$$R = R' - X(T - T')$$

may be used, where R = reading corrected at T, R′ = reading at T′, T = desired temperature, and T′ = temperature of actual reading, and X = change in scale division caused by a change in temperature of 1° C. For scale-readings of 40° to 50°, X equals 0·55; from 60° to 70°, 0·58; and from 70° to 80°, 0·62.

The oils examined were: olive, poppy-seed, maize, sunflower, rape, white mustard, black mustard, lard, pea-nut, cotton-seed, and sesame. A. G. L.

Composition of Kissi Pepper. A. Barillé. (*Journ. Pharm. Chim.*, 1902, xvi., 106-116.)—The pepper known as *Piper Famechoni-Heckel*, or Kissi pepper, is obtained from a new species of *piper* growing in French Guinea. The fruit resembles miniature bunches of grapes, and when pulverized yields a reddish-brown powder with a characteristic aromatic odour and a somewhat acid taste. It has been

used for some time past by the Soudanese troops in place of ordinary pepper. According to the results of the author's analysis, it has the following composition:

	Per Cent.
Water	14·60
Ash, soluble in water	3·61
Ash, insoluble in water	0·94
Volatile oil	4·47
Piperine	3·70
Starch	38·00
Cellulose	10·01
Glucose	5·21
Saccharose	1·66
Proteids	10·24
Gums, colouring matter, and soluble nitrogenous substances	5·27
Resins and fixed oil	3·95
Alcoholic extract	19·25
Ethereal extract	16·07
Total nitrogen	1·82

C. A. M.

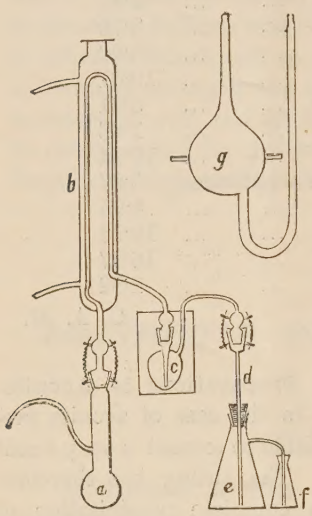
On the Determination of Aconitine in Certain Preparations of Aconite. H. Ecalle. (*Journ. Pharm. Chim.*, 1902, xvi., 18-23.)—In the case of aconite preparations made with glycerin and alcohol it is only possible to extract a very small proportion of the aconitine by treatment with ether. The author has therefore made experiments as to the possibility of effecting a complete precipitation of the alkaloid by means of silico-tungstic acid in the presence of a slight excess of nitric acid. He finds that the aconitine silico-tungstate is soluble to some extent in glycerin, and that it is necessary to use a large excess of silico-tungstic acid and nitric acid to prevent this. The amount of aconitine is found by multiplying the weight of the dried and ignited precipitate by the factor 0·793. C. A. M.

TOXICOLOGICAL ANALYSIS.

Notes on the Detection of Mercury in Cases of Poisoning. D. Vitali. (*Boll. chim. farm.*, 1902, xlii., 149; through *Chem. Zeit. Rep.*, 1902, 173.)—Mercuric sulphide, precipitated by sulphuretted hydrogen, is not wholly unattacked by nitric acid; if it is boiled for some time with equal quantities of nitric acid and water, it is partly oxidized and converted into nitrate, and this nitrate combines with the excess of sulphide to form a white double compound, which looks much like lead sulphate. This compound is identical with that already described by Rose, which was produced by treating a solution of mercuric nitrate with an insufficient quantity of sulphuretted hydrogen. If, then, the precipitate given by sulphuretted hydrogen yields a white powder with nitric acid, it must be investigated like the black sulphide of mercury. Vitali states that several undoubted cases of mercury-poisoning have occurred in which the metal has been missed on analysis, and he suggests that the above reaction is the cause of the error. F. H. L.

ORGANIC ANALYSIS.

Determination of Glycerol. S. Zeisel and R. Fanto. (*Zeits. landw. Versuchsw. Oesterr.*, 1902, v., 729; through *Chem. Zeit. Rep.*, 1902, 173.)—The author's process depends on the conversion of the glycerol into isopropyl iodide by means of boiling aqueous hydriodic acid, and the determination of the former as silver iodide. The flask *a* holds about 40 c.c., and its side tube is put in connection with a carbon dioxide apparatus. Into it is charged such a weight or volume of the substance to be analysed that the amount of silver iodide finally recovered does not exceed 0·4 gramme, together with 15 c.c. of a solution of hydriodic acid, having a specific gravity of 1·9 if the liquid is aqueous; otherwise of 1·7. The flask is surrounded with a glycerin bath, and made to boil gently. The condenser *b* is coupled to the Ehmann's warming apparatus *g*, and is kept full of water at a temperature between 50° and 70° C. The little flask *c* stands in a water-bath at the same temperature, and is one-third full of water containing some red phosphorus, or of a solution of potassium arsenite; *e* and *f* are provided with marks indicating 45 and 5 c.c. respectively, and they are filled to those marks with silver solution. The carbon dioxide current is passed at a speed of 3 bubbles per second. At the end of the distillation the contents of the receivers are rinsed out into a beaker, diluted to about 450 c.c., mixed with 10 or 15 c.c. of dilute nitric acid, heated on the water-bath, cooled, and the silver iodide is estimated either gravimetrically or volumetrically.



F. H. L.

Effect of Bleaching on the Constants of Beeswax. R. Berg. (*Chem. Zeit.* 1902, xxvi., 605.)—All processes of bleaching increase the acid number of beeswax, the natural method least, treatment with chromic acid most of all. Ordinary bleaching and permanganate leave the ester number unchanged, or slightly raise it; chromic acid always lowers it. The increase of the acid value is invariably so large as to lower the ratio; and without a qualitative analysis the bleached wax might be thought to be adulterated with stearin. The saponification value of bleached wax is also always a trifle higher than that of yellow wax. The influence of bleaching upon the iodine value is peculiar; contrary to expectation, treatment with chromic acid usually raises it; but Italian waxes exhibit a lower iodine absorption after any method of bleaching. The Buchner number is lowered a little by natural bleaching or by permanganate; chromic acid raises it, sometimes considerably. The Buchner number of Italian wax, however, falls during bleaching. Bleaching by the ordinary process or by permanganate does not affect the rotatory power of the wax, or has a tendency to increase it; but treatment with chromic acid, or any method of bleaching Italian wax, reduces the optical activity. Chromic acid frequently raises the melting-

point notably; other processes lower it a trifle. "Kothwachs," a by-product in working up pure beeswax, which is really a mixture of bleached and unbleached wax with dust and dirt, requires such drastic treatment to purify it again that its constants show irregular variations before and after bleaching. F. H. L.

Boiled Hübl Iodine Solution. M. Kitt. (*Chem. Zeit.*, 1902, xxvi., 554.)—The author gives further details respecting the stability of the boiled Hübl solution which he has already recommended (ANALYST, 1902, vol. xxvii., 22). A quantity of solution was prepared, and was found to contain 0·76756 gramme of free iodine per 25 c.c.; next day, after boiling under the inverted condenser for five hours, its titre was 0·27743 gramme—a loss of 63·9 per cent. After keeping one year it still tested 0·24876 gramme, so that during storage it only lost another 3·7 per cent. of its original strength. A sample of linseed oil examined with ordinary Hübl solution gave an iodine value of 165 (mean); with year-old boiled solution, using 50 c.c. per 0·1 to 0·2 gramme of oil, the figures were 163·2 and 164·5. F. H. L.

Behaviour of Araban towards Fehling's Solution. E. Salkowski. (*Zeits. physiol. Chem.*, 1902, xxxv., 240; through *Chem. Zeit. Rep.*, 1902, 174.)—The author has previously stated that, whereas xylan is precipitated from its alkaline solution by Fehling's solution, araban is not thrown down. Experiments on gum arabic, however, have shown that in certain circumstances araban is also capable of precipitation. An excess of Fehling's solution hinders the precipitation of araban, since the potassium-copper compound of the latter is soluble in the reagent, although but slowly. The difference in behaviour of alkaline solutions of araban and xylan towards Fehling's solution is extremely small; but if only those substances are present, the character of the precipitate enables them to be distinguished. From a mixed alkaline solution of araban and xylan alkaline copper solution throws down both bodies, but the copper compounds may be separated by their different solubilities in cold water. The araban, which passes into solution, retains a little xylan; but the xylan may be freed from araban by repeated washing. F. H. L.

Examination of Paper-making Materials by the Pentosan Method. E. Kröber and P. Rimbach, communicated by B. B. Tollens. (*Zeits. f. angew. Chem.*, xv., 508.)—When the material contains, in addition to pure cellulose (linen or cotton rags), only one other material, such as wood-meal, or sulphite cellulose, the determination of the pentosans enables one to estimate the quantities of each present. Pure cellulose yields about 1 per cent. pentosan; soda cellulose, 6 per cent.; sulphite cellulose, 7 per cent.; wood-meal, 12 per cent. By the use of these figures a simple calculation gives the quantities of the constituents, provided these are qualitatively known. Newspaper material generally consists of wood-meal and sulphite cellulose. A. M.

Determination of Tannin. E. Crouzel. (*Repert. Pharm.*, 1902, [3], xiv., 248; through *Chem. Zeit. Rep.*, 1902, 174.)—The tannin is brought into solution and

mixed with an excess of analgesin (dimethylphenylpyrazolone), together with twice as much of sodium bicarbonate. The opaque liquid gradually becomes clear and green, a precipitate falling. This is collected on a weighed filter, dried at 100° C., and weighed. The amount of analgesin equivalent to a certain quantity of tannin is ascertained by adding the former as long as a precipitate falls. The process might be made volumetric, but the end-point of the reaction is difficult to see. F. H. L.

The Estimation of Indigotin on Fabrics. A. Binz and F. Rung. (*Zeits. angew. Chem.*, 1902, xxiii., 557.)—A further examination has been made of the method of extracting the indigotin by means of glacial acetic acid (see ANALYST, vol. xxiv. 48). Experiments performed with pure indigo showed that in the process of extraction a portion of the dye stuff is destroyed, but this loss does not amount to more than a few tenths of a per cent. calculated on the weight of fabric, and is to a certain extent compensated by the fact that some of the fabric itself is extracted by the acetic acid. The method therefore yields satisfactory comparative figures. A. M.

Estimation of Mineral and Organic Impurities in Hard (Varnish) Resins. J. Hertkorn. (*Chem. Zeit.*, 1902, xxvi., 602.)—Owing to the lack of proper methods for the examination of the hard resins which are employed in varnish manufacture, it is customary to run samples through a number of sieves of specified gauges, preferring the materials according as they contain a higher percentage of large lumps, with chips or broken particles, and only a small quantity of dust. Since, however, varnish resins are costly, the dust and chips have to be used, and it is desirable that they shall contain as little foreign matter as possible. The impurities in broken copal and copal dust may range between 0·5 and 50 per cent.; but more than 5 per cent. of organic matter is unusual, 0·3 to 2·5 per cent. being the average, with 1 to 5 per cent. of mineral substances. Most objectionable to the varnish-maker among the organic impurities are humus-like bodies, fragments of wood, leaves, etc., since these are decomposed at a temperature of 300° C., and spoil the colour of the varnish. The author suggests the following method of extracting the resins from the accompanying noxious ingredients: A solvent is prepared by mixing together from 20 to 25 parts of amyl acetate, 40 to 50 parts of amyl alcohol, and 25 to 40 parts of ethyl alcohol of more than 96 per cent. strength. In a large light beaker 5 to 10 grammes of the sample, powdered as finely as possible, and if necessary first run through a cloth, are weighed out, and stirred carefully with 25 to 50 c.c. of the solvent, avoiding the production of lumps. The beaker is next placed in water at 70° or 80° C., still stirring till the liquid boils, and allowed to remain under cover for thirty or sixty minutes. When the residue appears sandy and no longer resinous it is set aside in a warm place to settle till clear, and the solution is run off into another vessel. The insoluble matter is then treated as before until the liquid ceases to leave a residue on evaporation, passing the washings through a paper tared at 105° (filtration being necessary as the less concentrated liquors do not settle clear). Finally, the precipitate on the filter is washed twice with ethyl ether, dried to

constant weight at 105° C., and weighed. Care must be taken that the paper does not become dry during the process. If the residue is still cohesive the whole extraction must be repeated. The residue may be used for a determination of ash, or the latter may be determined on a separate portion of the sample. F. H. L.

Experiments with the Kjeldahl Method of Nitrogen Estimation. H. D. Law. (*Journ. Soc. Chem. Ind.*, 1902, xxi., 847.)—The nitrogen was determined in a sample of leather, heating with sulphuric acid for different times in the presence of different oxygen carriers. When no oxygen carrier was used, but only potassium sulphate and acid, the solution did not always become clear even after one and a half hours' heating, and unless it did become so the result was low. In another series of estimations 2 grammes of copper sulphate were introduced in each case; after one hour the solutions were clear, and then constant results were obtained. With 1 gramme of potassium permanganate correct results were also obtained after heating half an hour only, but with both these carriers much precipitate is formed on adding alkali, and bumping consequently occurs. To avoid this difficulty the author used potassium persulphate instead. The leather was first digested for a quarter of an hour with sulphuric acid alone; the mixture was allowed to cool slightly, then 10 grammes of the persulphate were added, and the liquid was shaken up well and the heating continued. The reaction proceeded smoothly. In half an hour the solution was clear, and gave the correct result. A. M.

Determination of Hydrocyanic Acid. A. Archetti. (*Chem. Zeit.*, 1902, xxvi., 555.)—The solution containing the cyanide is shaken in an Erlenmeyer flask with a known excess of mercurous chloride and the mixture is filtered. The insoluble matter, consisting of metallic mercury and the excess of calomel, is then treated on the paper with a liquid composed of 2 volumes of 1·40 nitric acid and 1 volume of water, which attacks the mercury only; the residue of mercurous chloride is washed with water, dried, and weighed. The difference gives the amount of cyanide according to the relationship $Hg_2Cl_2 = 2HCN$. F. H. L.

INORGANIC ANALYSIS.

Notes on the Estimation of Copper by Potassium Permanganate. H. A. Guess. (*Journ. Amer. Chem. Soc.*, xxiv., 708.)—The following modification of the permanganate method for copper, which does away with the use of asbestos as a filtering medium, and consequently requires no filter-pump, is stated to give results at least as good as the iodide or cyanide methods, especially in the case of small percentages of copper. From 1 to 5 grammes of the material (ores, tailings, etc.) are digested with aqua regia to which a few drops of sulphuric acid have been added, the excess of acid is boiled off, and the solution diluted and filtered. The filtrate is neutralized with ammonia, rendered just acid with hydrochloric acid, and reduced by adding an excess of sodium sulphite solution, after which a slight excess of potassium or ammonium thiocyanate is added, the whole heated to boiling, and then, as soon as

the precipitate has settled, filtered through an extracted 11-centimetres filter-paper, the precipitate being well washed with hot water. The funnel containing the precipitate is removed to another vessel and filled twice with a boiling 10 per cent. sodium hydrate solution, which decomposes the cuprous thiocyanate. After thoroughly washing the insoluble cuprous hydroxide left on the filter, the filtrate and washings, which contain the sodium thiocyanate, are rendered strongly acid with sulphuric acid, and titrated whilst still warm with potassium permanganate. This latter should be standardized against pure copper treated as above, as, owing to the slight solubility of the cuprous thiocyanate, the value calculated from the iron value of the permanganate is a little too low. The small error caused by the action of the caustic soda on the filter-paper may be determined and allowed for by treating an empty filter in the same way and titrating the filtrate. A. G. L.

Rough Estimation of Tin in Tin-dye Baths. O. Geisel. (*Chem. Zeit.*, 1902, xxvi., 553.)—From solutions of stannic chloride, not containing too much free hydrochloric acid, and of a strength equivalent to between 0·075 and 0·1 gramme of $SnCl_4$ per 10 c.c., cold sodium hydroxide throws down all the metal before the acid is neutralized. The author therefore proposes to mix such a solution with a few drops of a 1 per cent. solution of malachite green, and to titrate the liquid with decinormal soda till the colour changes from the greenish golden-yellow of the lake to the original bluish-green tint of the dye. The operation may be carried out in a large beaker standing on a white ground, or, better, by the usual colorimetric method of comparison. Gravimetric experiments show that the calculation of the amount of tin present should be made according to the equation :

$$7NaOH + 2SnCl_4 = Sn(OH)_4 + SnCl(OH)_3 + 7NaCl.$$

F. H. L.

Volumetric Estimation of Small Quantities of Iron. F. Seiler and A. Verda. (*Chem. Zeit.*, 1902, xxvi., 804.)—When a solution of ferric thiocyanate is treated with potassium ferrocyanide, Prussian blue is formed, the red colour of the first compound, which quickly becomes brown, changing sharply to green, which afterwards turns to blue, when the whole of the thiocyanate is decomposed. The reaction proceeds according to the equation :

$$3[Fe(CN)_6K_4] + 2Fe_2(CNS)_6 = [Fe(CN)_6]_3Fe_4 + 12KSCN,$$

so that 4·92 grammes of ferrocyanide are equivalent to 1 gramme of iron. A potassium ferrocyanide solution is therefore prepared of such a strength that 1 c.c. is equal to 0·001 gramme of iron. The substance to be analysed is brought into solution in the form of ferric chloride, and a suitable quantity of the liquid is mixed with an excess of ammonium thiocyanate. The whole is diluted with water till a bright red colour results, and titrated with the ferrocyanide till a green colour appears. The authors give two examples of their method as applied to a medicinal powder containing iron, and a sample of red wine, the figures showing it to be exact.

F. H. L.

The Determination of Sulphur in Pig-iron by Eschka's Method. John V. R. Stehman. (*Journ. Amer. Chem. Soc.*, xxiv., 644.)—In this method 3 grammes of the powdered sample are mixed with 2·5 grammes of a mixture of 2 parts magnesia and 1 part sodium carbonate in a platinum crucible; the whole is covered with a layer of 0·5 gramme of the same mixture, and heated to a red heat for one hour. A gasoline burner is preferable for heating, since, if ordinary coal-gas is used, a shield must be employed to keep the products of combustion away from the mouth of the crucible. After allowing the mass to cool, it is treated with hot water and 10 c.c. bromine, the whole boiled for fifteen minutes, filtered, and, after the addition of 1·5 c.c. concentrated hydrochloric acid, the bromine is expelled from the filtrate by boiling, and the sulphur is precipitated with 10 c.c. of a 10 per cent. barium chloride solution.

The sample used for this method must be at least fine enough to pass through a 60-mesh sieve. Using a steel mortar, pestle, and hammer, this only requires five minutes for a 20-gramme sample. Results obtained in this way are practically identical with those obtained by three of the older methods. A. G. L.

On the Quantitative Separation of Zirconium from Iron. A. Gutbier and G. Hüller. (*Zeits. Anorg. Chem.*, xxxii., 92.)—The solution of iron and zirconium is precipitated hot with a small excess of ammonia and the precipitate filtered off; the filtrate is evaporated to dryness on the water-bath, the residue dissolved in a little acid, a small excess of ammonia added, and any resulting precipitate of zirconium hydroxide filtered off and added to the main precipitate, which is then dried and ignited at a red heat. The increase in weight of the crucible gives the weight of $Fe_2O_3 + ZrO_2$. The oxides are then very finely powdered in an agate mortar and heated to constant weight in a platinum boat in a current of hydrogen at a red heat. By this means the iron is completely reduced to the metallic state, the zirconium dioxide not being affected. From the loss in weight the quantity of ferric oxide, and hence that of zirconium dioxide, present in the original mixture of oxides may be calculated. A. G. L.

The Volumetric Determination of Molybdenum in Molybdenum Steel and Ferro-Molybdenum. James Brakes. (*Journ. Soc. Chem. Ind.*, 1902, xxi., 833.)—This is a modification of Kopp's method (see ANALYST, xxvii., 202). Weigh out 5 grammes, dissolve in 20 c.c. nitric acid and 20 c.c. hydrochloric acid, evaporate to dryness, add 20 c.c. of dilute sulphuric acid (1 : 1), and evaporate until white fumes appear. Cool, and then proceed as in Kopp's method (*loc. cit.*). In calculating the result, subtract the blank, then multiply the remainder by the iron equivalent of the permanganate solution and by the factor 0·605, as is indicated by the equation:

$$5Mo_{12}O_{19} + 17K_2Mn_2O_8 = 60MoO_3 + 17K_2O + 34MnO.$$

The results agree with those obtained by Whitfield's gravimetric and Kopp's methods. Tungsten should be removed before evaporation with sulphuric acid. Chromium does not affect the results even if present to the extent of 8 per cent. A. M.

On the Quantitative Separation of Zinc and Cobalt. Arthur Rosenheim and Ernst Huldschinsky. (*Zeits. Anorg. Chem.*, xxxii., 84.)—The authors have tried various methods for the separation of zinc and cobalt, and obtained the best results by precipitating the zinc as sulphide from an acetic acid solution of the double cyanides. In this method a small excess of potassium cyanide and a considerable amount of ammonium chloride are added to the neutral solution of the metals, which is then boiled for a short time to form the complex potassium cobalticyanide, and after the addition of acetic acid zinc is precipitated by means of hydrogen sulphide. Fairly good results were obtained by precipitating the zinc as sulphide from dilute solutions of the two metals to which acetic acid only had been added. The separation of cobalt as potassium cobaltinitrite, on the other hand, gave unsatisfactory results, even when both the solutions of the metals and of the potassium nitrite were acidified with acetic acid before mixing, as about 1 per cent. of the zinc appears to be precipitated with the cobalt. A. G. L.

The Cloudiness which occurs on Filtering Zinc Sulphide. O. Mühlhaeusser. (*Zeits. angew. Chem.*, 1902, xxiii., 731.)—Zinc may be entirely precipitated as sulphide, if mineral acid be first neutralized with ammonia and the solution be acidified with acetic acid before passing sulphuretted hydrogen. If ammonium acetate be also added the danger of loss of zinc is further reduced. When the sulphide is filtered off the filtrate is always cloudy, but this cloudiness is wholly due to sulphur. Known quantities of zinc were precipitated as described, and the precipitates were filtered off under various conditions, washed with a solution of acetic acid and sulphuretted hydrogen, and dissolved in hydrochloric acid. The solutions were then titrated with ferrocyanide, and in every case the correct amount of zinc was found. A. M.

The Marsh-Berzelius Arsenic Deposit. W. Ackroyd. (*Journ. Soc. Chem. Ind.*, 1902, xxi., 900.)—The colour of the arsenic deposits in the tube is liable to vary; in the case of organic materials they are practically always brown, but when inorganic substances are tested the deposits are often wholly or partly blue. This difference the author ascribes to variations in the rate at which the arsenic is evolved. When the velocity of the hydrogen in the tube is small, the blue deposit, if formed, is nearer the generator than the brown, but if the velocity be great the relative positions are reversed. The author considers that the brown colour is the normal one. In order to be able to measure and regulate the flow of gas, he arranges a platinum wire with its end 3 millimetres from the jet. The diameter of the flame should not exceed 3 millimetres, else there is danger of obtaining a blue deposit. A. M.

Analysis of Crude Sulphur. F. P. Carpenter. (*Journ. Soc. Chem. Ind.*, 1902, xxi., 832.)—To remove calcium sulphate treat with dilute hydrochloric acid, boil for about ten minutes, filter on a Gooch filter, and dry. The sulphur can be determined in this residue either by extracting with carbon disulphide, or by burning and

ascertaining the loss. The latter method gives results which are slightly too high, because some organic matter is removed at the same time. The calcium sulphate, when present, prevents the sulphur being completely dissolved by carbon disulphide, but when it has been removed this difficulty disappears. A. M.

A Volumetric Method for the Estimation of Sulphuric Acid in Soluble Sulphates. Yasujuro Nikaldo. (*Journ. Amer. Chem. Soc.*, xxiv., 74.)—The method depends on the precipitation of the sulphate in dilute alcoholic solution by means of standard lead nitrate solution, potassium iodide being used as indicator, the yellow colour of lead iodide becoming permanent only when all the sulphate has been precipitated. For $\frac{N}{10}$ solutions it is best to work in 60 to 70 per cent. alcoholic solutions, and for $\frac{N}{2}$ solutions in alcohol of 50 to 60 per cent. strength. The quantity of potassium iodide added should be about 0·2 gramme for 25 c.c. liquid. Solutions should be cold, not too dilute, and should not contain free nitric or hydrochloric acids, sodium acetate, or large quantities of chlorides. In the presence of heavy metals the addition of acetic acid is desirable to prevent precipitation of basic compounds. A. G. L.

Determination of Sulphuric Acid in Soils. C. B. Williams. (*Journ. Amer. Chem. Soc.*, xxiv., 658.)—In the method prescribed by the Association of Official Agricultural Chemists sulphuric acid is estimated by directly adding barium chloride to the acidulated soil solution. The author, however, points out the necessity of first removing the iron and aluminium by means of ammonia, since their salts, usually present in considerable amounts, exercise a solvent action on the barium sulphate, which is important, considering the small quantities of sulphuric acid usually present in soils. In thirty-five experiments in which the official method was compared with his modified one the results obtained with the latter were, on an average, more than 35 per cent. higher than those given by the former. A. G. L.

The Use of Persulphates in Analysis. H. D. Dakin. (*Journ. Soc. Chem. Ind.*, 1902, xxi., 848.)

Estimation of Manganese.—Ammonium persulphate was substituted for bromine in the usual method of precipitation in ammoniacal solution. Working with pure solutions containing known amounts of manganese very satisfactory results were obtained. When fixed salts are present, considerable quantities are carried down with the precipitated oxides of manganese. As in the bromine method, this difficulty must be guarded against. As the precipitate varies much in its degree of oxidation, it is not possible to estimate the manganese volumetrically from its oxidizing power.

Oxidation of Chromium Salts.—Chromic salts are readily converted into alkaline chromates by boiling with a large excess of caustic alkali and adding potassium persulphate until oxidation is complete. The solution may then be acidified with nitric acid and precipitated with mercurous nitrate, and the precipitate filtered,

washed, and ignited in the usual way. Ammonium persulphate cannot be used in this case, as it does not oxidize the chromium completely. A. M.

On the Analysis of Gases by Combustion. Walther Hempel. (*Zeit. Anorg. Chem.*, xxxi., 445.)—From some results obtained by him, the author concludes that mixtures of, *e.g.*, methane with large quantities of nitrogen are not completely burned when mixed with air and passed repeatedly through a red-hot capillary tube containing platinum, or over a red-hot platinum spiral, unless the gas mixture is actually capable of explosion. This condition may be usually fulfilled by adding sufficient oxygen, but in mixtures very poor in combustible gases the addition of hydrogen as well as oxygen becomes necessary. In any case, the analysis of gas mixtures by explosion appears to be safest. A. G. L.

The Estimation of Dissolved Oxygen in Water. William Naylor. (*Chem. News.*, lxxxv., 259.)—The estimations are carried out by Gerland's method (*Journ. Soc. Chem. Ind.*, xv., 15; xviii., 340), which depends on the reduction of indigo by sodium hyposulphite, as follows: About 50 to 100 c.c. tap water are placed in a four-necked Woulff's bottle, the air in which is then replaced by coal-gas which has been passed over heated copper turnings. The top of the hyposulphite burette, which is fitted into one of the stoppers of the Woulff's bottle, as well as the reservoir of hyposulphite solution, are also filled with this deoxidized coal-gas. The coal-gas escapes from the bottle by means of a tube in connection with a small water wash-bottle. When the bottle is full of coal-gas 1 or 2 c.c. of the indigo solution, which should contain 0·0005 gramme available oxygen per c.c., are run into the bottle by means of a tap-funnel, the end of which dips below the surface of the water, and exactly reduced by the hyposulphite. If the solution remains a pale straw-colour, the gas in the bottle is free from oxygen, and the hyposulphite solution is next standardized against the indigo. One hundred c.c. of the sample are then run in, and the quantity of hyposulphite necessary to destroy the blue colour produced noted. Nearly two and a half times this amount of hyposulphite solution is then run into the bottle, followed by 250 c.c. of the sample; the faint blue colour produced is removed by a few drops more of hyposulphite, and the total for the 250 c.c. ascertained.

The pure indigo, before being used, must be washed with water, hydrochloric acid, and alcohol, and then treated with ammonium persulphate in acid solution. By this method a hundred samples could be examined in one day without washing out the Woulff's bottle, the solution being removed from time to time through a syphon tube. A. G. L.

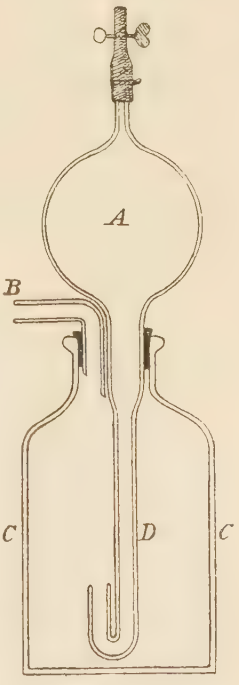
The Stability of Potassium Tetroxalate and Sodium Oxalate as Standard Substances for Volumetric Analysis. — Dupré and A. von Kupffer. (*Zeits. für angew. Chem.*, 1902, xv., 352.)—These substances have been recommended for use to standardize both oxydimetric and acid solutions, the salt being weighed out and

converted into carbonate by ignition. The tetroxalate may also be used directly to standardize alkaline solutions. Five different samples of potassium tetroxalate were tested at intervals. Of these three were bought and two were prepared from potassium oxalate and oxalic acid only. One of the specially prepared samples only gave constant results, the others all gradually losing strength as determined by standard permanganate solution. The strength as determined by titration with standard acid was, however, constant in each case, though the numbers for different samples are not identical.

In the case of sodium oxalate a purchased sample lost only 0·2 per cent. in fifty-nine days as determined by permanganate. A sample prepared from pure oxalic acid and soda gave a constant result, 99·36 per cent. The one satisfactory sample of tetroxalate gave the same figure. The permanganate was standardized by means of electrolytically deposited iron. The authors consider that sodium oxalate may be used with advantage, but not the tetroxalate. A. M.

APPARATUS.

A Modification of Hempel's Apparatus for Gas-Analysis. Theodore William Richards. (*Proc. Amer. Acad.*, xxxvii., 201 ; through *Zeits. Anorg. Chem.*, xxix., 359.)—The following simple pieces of apparatus have been designed for use in teaching gas-analysis, instead of the more expensive and cumbersome forms of Hempel. The pipette is replaced by a bulb mounted by means of a long tube in the bottle containing the absorbent reagent, as shown in the figure. To prevent the entry of air from below, the tube is narrowed at its lower end, and bent upwards. For the introduction of solid reagents the tube *D* is made wider and fitted with a stopper pierced by one hole, through which a small bent tube is inserted. For fuming sulphuric acid, the bulb should be ground into the neck of the bottle, which must also be fitted with another neck carrying a-ground in side-tube. If 50 c.c. of gas are used for the analysis, the volume of the bulb *A* should be about 75 c.c., and that of the bottle *C* 150 c.c.



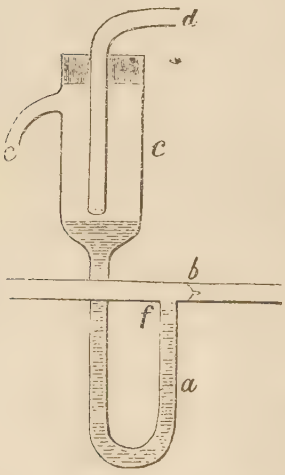
Hempel's burette may be replaced by an ordinary burette, either inverted, with the stop-cock on top, or else in its normal position, in which case the upper end is fitted with a rubber stopper, through which a capillary tube is inserted, care being taken that the stopper always occupies the same position. The ungraduated upper part of the burette must, of course, be carefully calibrated. The small size of the burette permits it to be readily surrounded by a water-jacket, which entirely obviates the errors arising from a change of temperature.

The manipulation of this apparatus is practically the same as that of Hempel.

In analysing about 50 c.c. of mixtures of air and carbon dioxide with it, the average error of seven determinations was only 0·04 c.c. (0·00 to 0·10 c.c.). A. G. L.

A Chemical Method for obtaining Reduced Pressures. Francis G. Benedict and Charlotte R. Manning. (*Amer. Chem. Journ.*, xxvii., 340.)—To obtain high degrees of exhaustion the authors have successfully employed the following method: Into the upper part of a Hempel desiccator of a total capacity of 3·5 litres 150 c.c. of concentrated sulphuric acid are poured. The dishes, etc., containing the material to be dried are next introduced, and finally 10 c.c. of pure anhydrous ether are delivered from a pipette upon the bottom of the desiccator. The cover is immediately put on, and the desiccator connected with a water pump until a pressure of 40 to 60 millimetres is indicated by a small manometer placed inside the desiccator. The stop-cock of the desiccator is then closed, when after a few minutes a vacuum of from 4 to 1 millimetres is obtained. This degree of exhaustion is reached in eight to twelve minutes after putting on the cover of the desiccator. The sulphuric acid may be used several times without losing its power of absorbing the ether vapour. A. G. L.

Governor for Use during Ultimate Analysis. I. Deiglmayr. (*Chem. Zeit.*, 1902, xxvi., 520.)—The object of the device shown in the accompanying illustration is to bring the ordinary process of combustion under automatic control, thus avoiding the necessity for watching the gas current, and for constantly manipulating the burner cocks. It is essentially a thermostat, placed, in the case of carbon and hydrogen determinations, between the water and the carbon dioxide tube. The main gas-supply pipe of the furnace is divided into two portions, gas entering at either end; that which heats the part where the oxidant alone is put passes direct from the service, but the gas which feeds the burners under the substance being analysed first enters the thermostat through *d*, and then escapes through *e*. The horizontal tube in the diagram is the connection between the sulphuric acid vessel and the potash bulbs, and it is reduced at the point *b* to a capillary of suitable bore. If, then, combustion is proceeding so quickly that there is danger of absorption not being complete, the current of carbon dioxide is too rapid to pass *b*, and pressure is set up in the combustion tube sufficient to force the mercury in *a* up into *c* till the coal-gas supply is choked. Thus the gas flames become smaller, the temperature of the tube falls, and combustion is rendered slower. An identical arrangement can be employed in nitrogen estimation. The original article records a large number of elementary analyses carried out with the aid of the apparatus described, these analyses having been performed without any attention being given to the furnace after it was once started, in some instances the operation proceeding unwatched for a considerable

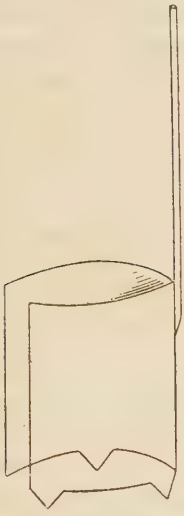


period of time. When the device is adopted, combustions should be conducted without a current of oxygen or air until the process is nearly complete. F. H. L.

Beckmann's Thermometer with Kühn's Additional Scale. (*Chem. Zeit.*, 1902, xxvi., 337.)—By means of the additional scale attached to the upper portion of the thermometer (see figure) it is easy to determine the necessary amount of mercury required for any given interval in the scale attached to the capillary tube. The auxiliary scale is so graduated in relation to this latter scale that, for example, when it records 50° the thread of mercury reaches to about the middle of the capillary $_{1}\frac{1}{0}{}^{\circ}$ scale. The necessary amount of mercury to be taken from the reservoir is thus directly known.

C. A. M.

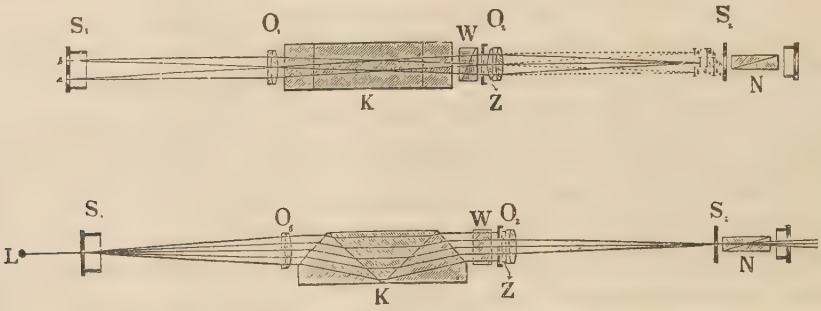
An Improved Platinum Electrode. (*Chem. Zeit.*, 1902, xxvi., 356.)—Krause recommends a platinum electrode made as shown by the annexed sketch. The imperfect cylindrical form makes it convenient for insertion and removal from the liquid, renders it a useful stirrer, and causes the deposited substance to be thrown down as a uniform layer. The electrode is constructed by Heraeus of Hanau. F. H. L.



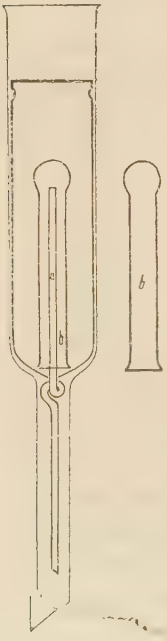
A New Form of Pyrometer (Wanner's). R. Hase. (*Zeit. für. angew. Chem.*, 1902, xv., 715-717.)—The apparatus is in the shape of a telescope, 30 centimetres long, and acts as a photometer. The construction of the optical part of the instrument is shown in Figs. 1 and 2.

At S_1 are two slits, *a* and *b*, placed vertically one above the other; O_1 is a lens at the focal distance from S_1, for making the rays parallel. K is a rectangular prism. W is a polarizer, and Z is a double prism. The lens O_2 collects the rays and throws images of the same directly on the slit S_2. The rays from *a* pass through the upper part of Z, and those from *b* through the lower half. Both are polarized at right angles to each other, and the eye, observing the images at S_2, sees the upper half of Z illuminated by *a* and the lower half by *b*. By rotating the analyser N, the intensity

of the light on the two halves may be equalized. A 6-volt incandescent lamp is fixed to the instrument, and lights one half of Z for comparison. The light from the glowing substance of which the temperature is to be determined enters the other slit,

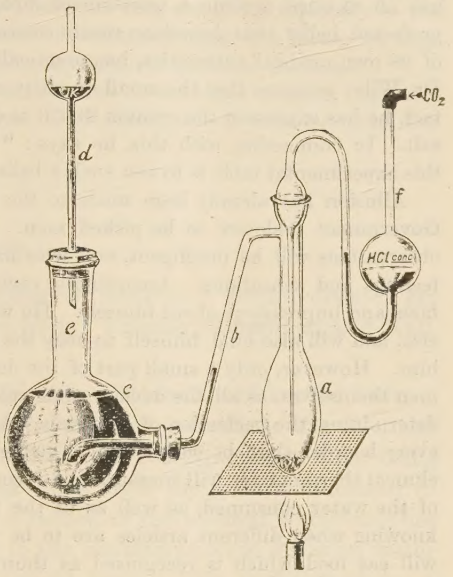


and the illumination is made equal in intensity to that of the lamp by turning the analyser. The reading of the scale of the instrument is then taken and compared with tables on which temperatures corresponding with the readings are given. The lamp is lighted by a 0·8 ampère current from an accumulator of 10 ampère-hour capacity. When the accumulator has run down to a certain extent, the lighting power of the lamp is altered, but may be corrected by comparison with a standard amyl acetate lamp. This operation is the work of a minute. Some of the temperatures observed by the author are interesting. Thus, molten iron showed from 1,372° to 1,384°; the same, when run from the furnace and commencing to solidify, 1,230°, and when the surface was solid, 1,012°; glass-smelting ovens had temperatures between 1,530° and 1,630°. A zirconium plate heated in an oxygen blast had a temperature of 2,090°; and an arc-light, using retort-carbon, 3,610°. W. P. S.



A Modified Soxhlet. G. Schüle. (*Chem. Zeit.*, 1902, xxvi., 653.)—The annexed sketch shows the construction of an extraction apparatus specially designed for the analysis of butter, which is claimed to exhibit several advantages over the usual form of Soxhlet. The inverted tube is detachable, as indicated, and by its central position, surrounding the syphon, allows a layer of filtering material to be packed into the extractor more uniformly than heretofore. Being inside, too, these tubes are less liable to injury. The constriction at the upper end of the main vessel enables it to be laid safely on its side in the drying oven without any danger of its liquefied contents running out. The apparatus is patented and is made by F. Mollenkopf, of Stuttgart. F. H. L.

Apparatus for the Volumetric Estimation of Chlorine. R. Marc. (*Chem. Zeit.*, 1902, xxvi., 556.)—This simple apparatus, which obviates some of the inconveniences attached to Bunsen's apparatus, generally used for this purpose, is designed for the examination of such substances as are attacked but not completely decomposed by cold hydrochloric acid, such as yield a solution which is not suited for titration, or such as are conveniently analysed for other constituents in their original solution after the chlorine has been driven off. The joint between the hydrochloric acid bulb and the boiling flask is ground; that between the receiver and the check bulb might also be ground if desired, but most of the chlorine is absorbed in the main vessel, and the residue is so highly diluted with carbon dioxide that this refinement is not necessary. The method of using the apparatus is obvious.



F. H. L.

A GOVERNMENT SCIENTIFIC BOARDING-HOUSE.

(*Reprinted from the "Times" of September* 29, 1902.)

[FROM AN AMERICAN CORRESPONDENT.]

ONE of the advantages which the United States has had, especially since it became fairly populated, has been that it is apparently an inexhaustible field for experiments. The latest of these is, perhaps, the most novel of all. It is neither more nor less than the opening, by the authority of an Act of Congress, of a boarding-house which is to be conducted upon purely scientific principles. It has for its declared purpose the testing of the effect of various preservatives, colouring substances, and other food admixtures upon persons supposed to be in good health. A good deal of ridicule has already been wasted upon this proposal, but Dr. H. W. Wiley, chief of the Division of Chemistry in the Department of Agriculture, under whose auspices this experiment is to be carried on, has recently given an outline of the work which he intends.

According to this announcement, board will be provided for twelve individuals. These are to be chosen upon scientific principles, and for this purpose resort will first be had to the various bureaus of the Agricultural Department, and, after them, to the college students resident in Washington. It is intended to maintain the tables for months, and perhaps for years. It is Dr Wiley's purpose to do something towards settling the controversy over the healthfulness of various articles almost universally used in everyday diet. It is well known that medical authorities, whose business in life it seems to be to differ each from the other, have condemned one by one every article consumed by man. This controversy has raged with especial bitterness whenever, proceeding beyond the domain of purely natural products, an attempt is made to enlist the services of the chemical laboratory for the preservation of food. It is therefore one of the purposes of the experiment to find out the relative harmfulness of various articles.

This is defined as a part of the movement towards pure food legislation. For instance, borax has all at once become a question of diplomacy. The German Government, acting upon its professed belief that American meats treated with it are harmful, in spite of the contrary view of its own medical authorities, has practically prohibited the importation of meats thus treated. Dr. Wiley assumes that the small quantity of boric acid used in curing meat is not harmful. In fact, he has expressed the opinion that it is decidedly less hurtful than an equivalent quantity of salt. In connection with this, he says: "I believe this, but I do not know it. The object of this experimental table is to test such a belief in the most practical way."

Allusion has already been made to the fact that the boarders to be accommodated at this Government table are to be picked men. It is recognised that they must be persons whose observations will be intelligent, and who have the power to express with some accuracy their feelings and sensations. Accordingly, each boarder will keep a diary, and record all sorts of facts and impressions about himself. He will be put upon his honour to eat nothing anywhere else, and will also bind himself to obey the scriptural injunction, and to eat what is set before him. However, only a small part of the desired information will come from the records of the men themselves, as all the devices understood by the medical profession will be resorted to for determining the perfection of digestion. Among the rules which will be observed is one that every boarder shall be weighed upon rising from bed in the morning. Three times a day the clinical thermometer will measure and record his temperature. A careful account will be kept of the water consumed, as well as of the food. The boarders will not have the advantage of knowing when different articles are to be tried upon them. For at least half the time they will eat food which is recognised as thoroughly pure. This is to be known as a relaxation diet. The object of this will be not only to prevent any real injury to the system, but also to tell how far into a period of normal conditions the effect of former harmful ones may persist. At each meal, also, some men will be eating the treated, or doctored, food, and some pure food, divided as the physician may direct. The quantities of adulterants employed are not to be perceptible at any time to the senses, although a doubt is expressed as to the ability to carry out this rule when it comes to colouring matters.

The preservatives for these experimental tables will be prepared and applied to the food by experts, and the quantity employed in each particular instance will be measured with the greatest accuracy. The detailed effects towards which the inquiry will be directed will concern various organs of the body and known constitutional tendencies to certain diseases. For instance, salicylic acid will be subjected to all the demands which, in the commercial movement of food, it is ever likely to make on the physical systems of American consumers. It is expected that the tabulated results will throw light upon the degrees of danger, and also define and fix the limits of safety, if any, in the use of this particular acid. It is intended that the same process shall be applied all the way through the list of many inventions which man has sought out in articles of diet. A curious feature of the experiment, as explained by Dr. Wiley, is that an attempt will be made to keep the boarders the same weight during their entire stay at the table, as a fluctuation in this respect might add a confusing element to the result. When it is discovered from the daily weighing that the subject is gaining a little, his ration will be so adjusted in its fat-producing elements that this tendency will be corrected, and the food at all times will be so generally wholesome and appetizing that no one in ordinary health need expect to lose weight.

This brief outline of an experiment which is being subjected to serious consideration and to trial, seems, as already explained, to be a part of a movement for the suppression of adulteration. At the present time this is a function belonging to the State Legislatures, with the result that a great deal of confusion has already been produced. For the last fifteen years a Bill has been pending before Congress for the enactment in a Federal law of the various provisions now incorporated in the State laws, rejecting those which have been shown to be impracticable.

Thus, standards of strength in vinegar, cream, and all sorts of articles, are now different in different States. This legislation has, it is explained, become very annoying, especially to the manufacturers of honest goods, so that there is more of a willingness than has heretofore been manifested that the Federal Government should enact a law to cover all these questions.

If the experiment which has been explained is not subjected to too much ridicule, there will probably result from it some reports which, whatever their value, will at least be novel and interesting.

REVIEWS.

WATER-SUPPLY: CONSIDERED PRINCIPALLY FROM A SANITARY STANDPOINT. By WM. P. MASON. New York: Wiley and Sons; London: Chapman and Hall. Price $4.

This work, which is the third edition of Professor Mason's well-known book, is a welcome addition to the library, as, although the chapters relating to the chemical and bacteriological examination of water are omitted in consequence of their being published separately, the work deals on broad lines with the general question of water-supply under varying conditions. After a review of the ancient water-supplies and the Roman aqueducts, the author proceeds to the consideration of drinking water and disease, more especially in relation to typhoid fever. This is followed by a review of the various processes for the artificial purification of water and various sources of supply, such as rain, river, and stream water, stored, ground, and deep-seated water, a consideration of the daily quantity required per head of the population, and the action of water upon metals. Whilst it cannot be said that there is any considerable quantity of novel information contained in the text, which forms most interesting reading, it must be confessed that the author has gathered together a great deal of scattered information upon the general question, with the result that a most useful work is produced, which is thoroughly worth the careful study of those seeking information on the subject. The statistics referring to American experience with which the book abounds constitutes a most important feature. A carefully compiled index completes a work which we are glad to have on our bookshelf.

W. J. D.

A TEXT-BOOK OF INORGANIC CHEMISTRY. By Dr. A. F. HOLLMAN. New York: Wiley and Sons; London: Chapman and Hall. Price 10s. 6d.

This is, in many respects, a most excellent and interesting work. It is well got up, and is commendably free from printers' errors; is up to date as to facts, and adequately deals with modern views and theories. The theoretical portions are, indeed, the feature of the work. Theories are very fully and clearly discussed, and are far more frequently used in explanation of reactions described than is usual in manuals of chemistry. We could, indeed, have wished that these portions had been treated consecutively, and had not been scattered over the whole work, sometimes without any apparent reason for the place in which they are found, but in this the author follows the example of most text-books.

The descriptive portions are not quite so good; there are some strange omissions, and here and there we come upon what we can only characterize as somewhat careless writing or reasoning which, in an author who, as a rule, has evidently taken great pains to be strictly logical and correct, is rather surprising.

The production of oxygen from barium peroxide is not mentioned, and, indeed, no process for the production of oxygen on a large scale is given. Six methods for the preparation of hydrogen are briefly described, but its preparation by the passage of steam over red-hot iron is not among them, though, in another part of the book, allusion is made to the reaction involved.

On page 3 we are told, without any qualification, that physics deals with temporary, chemistry with lasting, changes of matter; whereas, in many, if not in all, cases, the temporary or lasting character of the change depends on the temporary or lasting character of the condition which has brought about the change. Ice melts at 0° C., and remains water as long as the temperature remains between 0° C. and 100° C.; mercury, when heated for some time to near its boiling-point in contact with oxygen, becomes converted into mercuric oxide which, when the temperature is raised, breaks up into mercury and oxygen; yet the latter is a chemical, the former a physical change. Many similar cases will occur to the reader.

On page 10 we are told that the fact that a glowing splinter, when introduced into an atmosphere of oxygen, begins at once to burn brightly, is ordinarily used as a characteristic test for oxygen. If this is so it is a mistake, as should have been pointed out by the author; the facts are correctly stated under nitrous oxide. On page 24 we find it stated that when an electric current is passed through water to which a little sulphuric acid has been added, two volumes of hydrogen are evolved for every 1 volume of oxygen; as a matter of fact there is always a slight deficiency of oxygen.

We have noted some more instances of the same nature, but the above will be sufficient to illustrate our meaning; they are, after all, but minor blemishes easily corrected in a new edition, and we can heartily recommend this text-book to teachers and advanced students.

A. D.